

Volume 15, Number 4, 2009

ISSN 1815-1094

Pakistan Journal
of
WEED SCIENCE RESEARCH
A quarterly research journal of weeds and medicinal herbs



Weed Science Society of Pakistan
Department of Weed Science
NWFP Agricultural University, Peshawar-25130, Pakistan
Ph.92-91-9216542/9218206/5842589; Fax: 92-91-9216520
website:www.wssp.org.pk/

STUDIES ON EFFECT OF SEEDING RATES ON WEED SUPPRESSION IN WHEAT (*Triticum aestivum* L.)

Altaf Sher¹, Muhammad Riaz Chattha¹, Shahida Khalid¹ and
Mohammad Mumtaz Khan²

ABSTRACT

The study was carried out at National Agriculture Research Center, Islamabad, to decipher the effect of seeding rate on weed suppression in wheat variety 'Margalla 99' sown at four different seeding rates (80, 100, 120 and 140 kg ha⁻¹) Weed density was lower in 120 kg ha⁻¹ as compared to 80, 100 and 140 kg ha⁻¹. Spike length (9.90 cm), spikelets/spike (2.20) and total grain yield (2.77 tons ha⁻¹) were also highest in 120 kg ha⁻¹ treatment. Data revealed that weed density declined and yield components increased with the increase in seed rate.

Key words: *Triticum aestivum*, seeding rates, weed control.

INTRODUCTION

There are approximately 350,000 botanically acknowledged plant species, but only 24 (i.e. 0.007 % of them) are used as crops to satisfy most human requirements for food and fiber (Wittwer, 1980). Due to our strong dependence upon a limited number of plant species, the future welfare of mankind is strongly linked to the degree of understanding what we achieve of their potential productivity and adaptability to environmental constraints (Evans, 1975). Not only are these species remarkably few, but their contributions to total production are not evenly distributed among crops. Bread wheat (*Triticum aestivum* L.) undoubtedly plays a major role among the few species widely grown as food sources, and likely was the main crop even in the beginning of agriculture (Harlan, 1981). Wheat is the most widely grown crop in the world (Kent and Evers, 1994). Approximately one sixth of the total arable land is cultivated with wheat. For the 1986-1995 decade this area was 223 million hectares and the production was 545 million tons (data from FAO, 1988-1995). Wheat provides more than 50% of total calories and 60% of the total proteins consumed by the population as a whole to feed the ever-increasing population in the country, the need for

¹ Weed Science Program, National Agriculture Research Center, Islamabad, Pakistan

² University of Peshawar, Peshawar, Pakistan.

more wheat will continue. There are enough possibilities to increase wheat yields in Pakistan through developing new high yielding varieties and adoption of proper package of technology (Sial, et al. 2000; Arian et al. 1999). Cultivated land is almost 20.81 million hectare of which 6.24 comprises on barani area. About 1/3 of total barani area is under wheat cultivation that produces low (1.13 t ha^{-1}) yield (GOP, 2003).

Weeds compete with major crops for the limited resources of soil moisture and nutrients. Wheat and barley are vigorous crops that rapidly cover the soil surface and often out-compete weeds. Small grains and other grasses are often planted as cover crops to suppress weeds. However, weeds can be a problem in wheat and barley especially where crop rotation is not practiced. An integrated approach to weed management in wheat and barley includes preventing the introduction or spread of weeds, crop rotation, cultural practices that result in a vigorous crop, and chemical treatment when necessary. Crop rotation is an integral component of weed management since many weeds are easier to control in certain crops. Early planting dates generally result in plants that tiller more and are more competitive with weeds. Drill seeding produces a more uniform stand than broadcasting and helps in weed control. High seeding rates are also more competitive with weeds (Turk and Tawaha, 2003).

Christensen and Rasmussen (1996) explained that the experiments in winter wheat fields in Denmark showed the need for weed control. This varied with different drilling dates, seed rates and varieties of wheat. The experiments showed that seed rates lower than 300 seeds m^{-2} had the lowest grain yield and the highest weed dry matter. Results of Korres and Froud-Williams (1997) revealed that seed rate significantly affected weed suppression of a naturally occurring weed infestation dominated by *Poa* spp., *Matricaria* spp. and *Stellaria* spp. at Shinfield, UK during 1995-96. Sheikh, et al. (1998) explained that in field experiments in 1990/91 to 1992/93 at Pirsabak, Pakistan, wheat was sown on 15 October, 15 November and 15 December at rates of 50, 100 or $150 \text{ kg seed ha}^{-1}$, and was not weeded. Days to heading and maturity were least with December 15 sowing and greatest with November 15 sowing. The present study was carried out to observe the response of wheat density on weed population in wheat.

MATERIALS AND METHODS

A field trial was conducted at the experimental area of National Agriculture Research Centre, Islamabad. Islamabad is situated at $33^{\circ}.33$ Latitude (N) and $73^{\circ} 00$ Longitude (E) and lies in

sub-tropical zone, characterized by hot summers and cold winters. The mean maximum temperature during summer is 40°C and mean minimum temperature, during winter is 3°C. Mean annual rainfall is 10000 mm. An experiment was laid out on wheat variety Margalla 99 sown at four different seed rates viz. 80, 100, 120 and 140kg ha⁻¹. Path of one meter was kept between each replication. The net plot size was 10 x 6m². Each plot consisted of 40 rows, in which row-to-row distance was 15cm. Nitrogen (N) and phosphorus (P) were used as fertilizer. Source of (N) was urea and (P) was DAP, urea was used at the rate of 220 kg ha⁻¹ and DAP at 175 kg ha⁻¹. Weed density in each plot was recorded at 15 days interval from three randomly selected places by using one-meter square quadrat.

The data recorded for the growth and yield determining parameter of wheat crop such as plant height (cm), number of spikelets/spike, number of grains/spike, spike length, 1000 grain weight and total grain weight. The data were subjected to the ANOVA technique using least significant difference test at 5% level of probability compare the difference among treatment means.

From each treatment five plants were randomly selected for agronomic studies. Plant height was measured from ground level to the tip of the awn. Spike length was measured from the node of first spikelet to the tip of the awn. The spikelets were counted from the lowest spikelets to the tip of awn. One thousand grains were randomly selected from the grains to determine their weight in each treatment.

RESULTS AND DISCUSSION

The data presented in Fig.1. depict that in the months of February and March weed density was lower in 120 kg ha⁻¹ as compared to all other seeding rates. Crop was sown in the month of December and at the early stage of the crop, weed and wheat competition is higher. It is clearly observed that in the month of Feb and March the weed density was significantly lower where the seed rate was higher as compared to others. Although at the later stages i.e. April and May there is no significant difference in weed density because at that stage the wheat is at maturity stage and has lesser affect of weeds on plant.

The same results were observed by Shrivastava *et al.* (1994) in on-farm field experiments during the rabi [winter] seasons of 1983-85 in Madhya Pradesh. They concluded that wheat cv. WH 147 grain yields were higher at the sowing rate of 120 than 90 kg seed ha⁻¹ (3.12 vs. 2.56 t ha⁻¹). Similar communication was made by Mahmood *et al.* (2005) who concluded that higher seeding rate makes a crop more competitive and may help in controlling weeds.

As far as the yield and yield components are concerned the data in the Table-1 show that with the increased rate of wheat seed, a consequent increase in yield and yield components was recorded. Data indicates clearly that plant height (79.25 cm) was highest in the treatment 140 kg ha⁻¹, whereas spike length (9.90 cm), spikelets/spike (20.20) and total grain yield (2.77 tons ha⁻¹) was highest 120 kg ha⁻¹ treatment. This results clearly indicates that the higher seed rate significantly increased the yield and yield components. Similar observations are given by different scientists.

Koscelny *et al.* (1991) conducted three field experiments with winter wheat cv. 2157 in 1989 at Chickasha, Lahoma and Perkins, Oklahoma, on cultural control of *Bromus secalinus* at various infestation levels. Results obtained by increasing winter wheat sowing rate and row spacing interactions influenced *B. secalinus* density, biomass or seed in harvested wheat at 2 of the 3 locations. Suppressive effects on *B. secalinus* by increasing wheat sowing rates and reduced row spacing were greater in wheat sown in September than later. At two other locations, increasing sowing rate from 67 to 101 kg ha⁻¹ or reducing row spacing from 22.5 to 15 cm increased winter wheat yield over a range of *B. secalinus* infestation levels.

Bhullar and Walia (2004) revealed that the crop sown with 50% higher seed rate (i.e. 150 kg ha⁻¹) produced more dry matter which in return reduced the dry matter accumulation of *Phalaris minor* by 35.4% resulting in increasing grain yield of wheat by 12.3% over recommended seed rate.

Subhan *et al.* (2004) conducted a 3-year (1990-91 to 1992-93) study in Pakistan to determine the effect of sowing rate and weed control method on grain yield and yield components of bread wheat. Three seeding rates (50,100 and 150 kg ha⁻¹) were observed. Sowing rate 100 kg per hectare significantly increased grain per spike, 1000 grain weight and grain yield. Stougaard and Xue (2004) conducted a 3 year field experiment at Kalispell, USA to investigate the effects of spring wheat seed size and seeding rate on wheat spike production, biomass, and grain yield under a range of wild oat densities. Wheat plant density, spikes, biomass, and yield all increased as seed size and seeding rates increased. Averaged across all other factors, the use of higher seeding rates and larger seed sizes improved yields by 12 and 18%, respectively.

These above results are similar to the studies carried out at NARC. The best seed rate was found to be (120 kg ha⁻¹) that reduced weeds by 63% and increased grain weight by 67%.

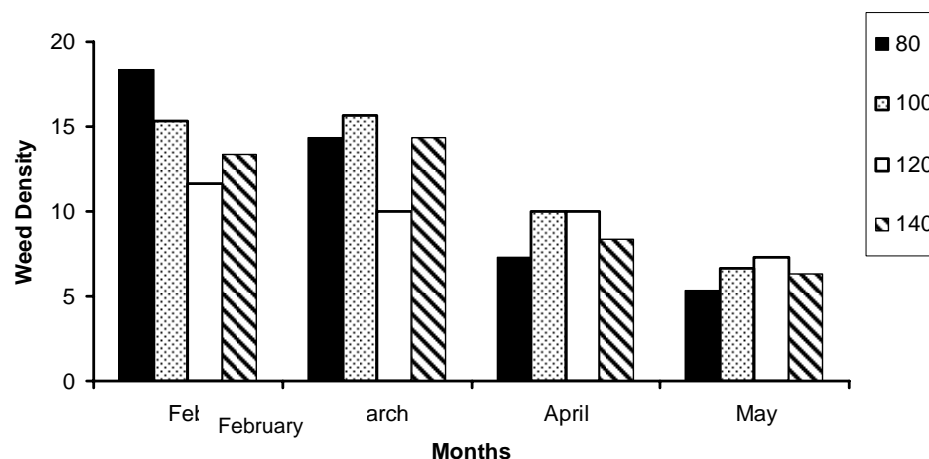


Fig.1. Weed density in wheat cv. Margalla 99 under different seed rates.

Table-1. Yield and yield components in wheat cv. Margalla 99 with different seed rates.

Treatments	Yield Components				
	Seed Rate (kg ha ⁻¹)	Plant height (cm)	Spike Length (cm)	Spikelets/Spike (No.)	1000 Grain Wt. (g)
80	77.12	9.42	19.06	39.67a	2.35b
100	77.84	9.53	19.86	32.16c	1.86c
120	78.17	9.90	20.20	37.02b	2.77a
140	79.25	9.19	19.13	37.56b	2.56b
LSD _{0.05}	NS	NS	NS	0.56	0.24

Means not sharing a letter in common do not differ significantly by LSD Test at P≤0.05.

REFERENCES CITED

- Arian, M.A., M. Ahmad and M.A. Rajput. 1999 Evaluation of wheat genotype under varying environments included through changing sowing dates. Proc. Symp. New Genetical Approaches to Crop improvement-III Nuclear Institute of Agriculture, Tandojam, Pakistan. pp. 163-173.
- Bhullar, M.S. and U.S. Walia 2004 Effect of seed rate and row spacing on the efficacy of clodinafop for combating Isoproturon

- resistant *Phalaris minor* Retz. *In* wheat. *Plant Prote. Quart.*, 19(4): 143-146.
- Christensen, S. and G. Rasmussen 1996 Crop-weed competition and choice of variety, seed rate and drilling date in winter wheat, 13th Danish Plant protection conference: Side effects of pesticides, weeds. SP-Rapport Statens Planteavlsvforsog 3: 103-111.
- Evans, L.T. 1975 Crops and world food supply. Crop evolution and the origins of crop physiology. *In* L. T. Evans. (ed.). *Crop Physiology*. Cambridge University Press, Cambridge, UK, pp, 1-22.
- FAO. 1995. *FAO Yearbook and FAO Processed Statistics Series1, 1988-1995*, Food and Agriculture Organization of the United Nations, Rome.
- GOP. 2003. *Economic Survey 2002-03*, Finance Division, Economic Advisor's Wing, Islamabad.
- Harlan, J.R. 1981. The early history of wheat: earliest traces to sack of Rome, *In* L. T. Evans and W. J. Peacock (Eds.) *Wheat Science Today and Tomorrow*, Cambridge University Press, Cambridge, UK, pp. 1-19.
- Kent, N.L. and A.D. Evers. 1994. *Technology of Cereals*, Fourth Edition, Elsevier Science Ltd. Oxford, UK.
- Korres, N.E., R.J.F and Williams. 1997. The use of varietals selection and seed rates for enhanced weed suppression in winter wheat (*Triticum aestivum* L.). Brighton Crop Prot. Conf.: Weeds. Proc. International Conf., Brighton, UK, 17-20 November 1997, 2: 667-668.
- Koscelny, J.A., T.F. Peeper, J.B. Solie and S.G. Solomon (Jr.) .1991. Seeding date, seeding rate, and row spacing affect on wheat (*Triticum aestivum*) and cheat (*Bromus secalinus*). *Weed Tech.*, 5: (4), 707-712.
- Mahmood, T.Z., A. Sher, M.R. Chattha, T. Aziz, R. Kashif and S. Hussain .2005. Wild oat control. *Weed Management Program* 1: 1-4.
- Sheikh, S.A., G.H. Jamro, F. Subhan, L.A. Jamali and M.H. Dhaunroo 1998 Effect of sowing time, crop density and weed control on the heading and maturity of bread wheat. *Pak. J. Bot.* 30(2): 221-225.

- Shrivastava, U.K, R.L. Rajput and N.K. Sinha 1994. Effect of seed rate, fertility levels and weeding on the yield of wheat. *Agric. Sci. Digest Karnal*, 14(1): 5-7.
- Sial, M.A., M.A. Arain and M. Ahmed. 2000. Genotype x environment interaction on bread wheat grown over multiple sites and years in Pakistan. *Pak. J. Bot.* 32(1): 85-91.
- Stougaard, R.N and Q.W. Xue. 2004. Spring wheat seed size and seeding rate effects on yield loss due to wild oat (*Avena fatua*) interference. *Weed Sci.* 52(1): 133-141.
- Subhan, F., M. Khan and G.H Jamro. 2004. Effect of different planting dates, seeding rate and weed control method on grain yield and yield components in wheat. *Sarhad J. Agric.* 20(1): 51-55.
- Turk, M.A and A.M. Tawaha. 2003. Weed control in cereals in Jordan. *Crop Prot.* 22 (2): 239-246.
- Wittwer S.H. 1980. The shape of the things to come. *In* P.S. Carlson (ed.), *Biology of Crop Production*. Academic Press, Inc., New York, pp. 413-459.